SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier
- Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)
- Item number: 44-3800

1.2 Relevant identified uses of the substance or mixture and uses advised against
No further relevant information available.

1.3 Details of the supplier of the safety data sheet
- Manufacturer/Supplier: Strem Chemicals, Inc.
  7 Mulliken Way
  NEWBURYPORT, MA 01950
  USA
  info@strem.com

Further information obtainable from: Technical Department

1.4 Emergency telephone number:
- EMERGENCY: CHEMTREC: +1 (800) 424-9300
  During normal opening times: +1 (978) 499-1600

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
- Classification according to Regulation (EC) No 1272/2008
  GHS03 flame over circle
  Ox. Liq. 3  H272  May intensify fire; oxidiser.

2.2 Label elements
- Labelling according to Regulation (EC) No 1272/2008
  The product is classified and labelled according to the CLP regulation.
- Hazard pictograms
  GHS03

Signal word Warning
- Hazard statements
  H272 May intensify fire; oxidiser.
- Precautionary statements
  P101 If medical advice is needed, have product container or label at hand.
  P102 Keep out of reach of children.
  P103 Read label before use.
  P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
  P262 Do not get in eyes, on skin, or on clothing.
  P280 Wear protective gloves/protective clothing/eye protection/face protection.
  P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
  P403+P233 Store in a well-ventilated place. Keep container tightly closed.
  P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
SECTION 3: Composition/information on ingredients

3.2 Chemical characterisation: Mixtures

Description: Mixture of substances listed below with nonhazardous additions.

Dangerous components: Void

Additional information: For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

After inhalation: Supply fresh air; consult doctor in case of complaints.

After skin contact: Immediately rinse with water.

After eye contact: Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing: If symptoms persist consult doctor.

4.2 Most important symptoms and effects, both acute and delayed

No further relevant information available.

4.3 Indication of any immediate medical attention and special treatment needed

No further relevant information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents: Use fire extinguishing methods suitable to surrounding conditions.

5.2 Special hazards arising from the substance or mixture

No further relevant information available.

5.3 Advice for firefighters

Protective equipment: No special measures required.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Not required.

6.2 Environmental precautions

No special measures required.

6.3 Methods and material for containment and cleaning up:

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.

6.4 Reference to other sections

See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

No special precautions are necessary if used correctly.

Information about fire - and explosion protection: No special measures required.
7.2 Conditions for safe storage, including any incompatibilities

- Requirements to be met by storerooms and receptacles: No special requirements.
- Information about storage in one common storage facility: Not required.
- Further information about storage conditions: None.

7.3 Specific end use(s) No further relevant information available.

SECTION 8: Exposure controls/personal protection

- Additional information about design of technical facilities: No further data; see item 7.

8.1 Control parameters

- Ingredients with limit values that require monitoring at the workplace:
  The product does not contain any relevant quantities of materials with critical values that have to be monitored at
  the workplace.
- Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls

- Personal protective equipment:
- General protective and hygienic measures: Wash hands before breaks and at the end of work.
- Respiratory protection: Not required.
- Protection of hands:

  Protective gloves

  The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
  Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the
  chemical mixture.
  Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
  Material of gloves
  The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and
  varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance
  of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
  Penetration time of glove material
  The exact break through time has to be found out by the manufacturer of the protective gloves and has to be
  observed.
  Eye protection: Goggles recommended during refilling

9.1 Information on basic physical and chemical properties

- General Information
  - Appearance:
    - Form: Liquid
    - Colour: Orange
  - Odour: Odourless
  - Odour threshold: Not determined.
  - pH-value: Not determined.

- Change in condition
  - Melting point/freezing point: 0 °C
  - Initial boiling point and boiling range: Undetermined.

- Flash point: Not applicable.
- Flammability (solid, gas): Not determined.
Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

- Ignition temperature:
  Decomposition temperature: Not determined.

- Auto-ignition temperature: Product is not self-igniting.

- Explosive properties: Product does not present an explosion hazard.

- Explosion limits:
  Lower: Not determined.
  Upper: Not determined.

- Vapour pressure at 20 °C: 23 kPa

- Density at 20 °C: 1 g/cm³
  Relative density: Not determined.
  Vapour density: Not determined.
  Evaporation rate: Not determined.

- Solubility in / Miscibility with water: Not miscible or difficult to mix.

- Partition coefficient: n-octanol/water: Not determined.

- Viscosity:
  Dynamic: Not determined.
  Kinematic: Not determined.

- Solvent content:
  Organic solvents: 0.0 %
  Water: 95.0 %
  VOC (EC): 0.00 %

- 9.2 Other information: No further relevant information available.

SECTION 10: Stability and reactivity

- 10.1 Reactivity: No further relevant information available.
- 10.2 Chemical stability
- Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.
- 10.3 Possibility of hazardous reactions: No dangerous reactions known.
- 10.4 Conditions to avoid: No further relevant information available.
- 10.5 Incompatible materials: No further relevant information available.
- 10.6 Hazardous decomposition products: No dangerous decomposition products known.

SECTION 11: Toxicological information

- 11.1 Information on toxicological effects
  Acute toxicity: Based on available data, the classification criteria are not met.
  Primary irritant effect:
  Skin corrosion/irritation: Based on available data, the classification criteria are not met.
  Serious eye damage/irritation: Based on available data, the classification criteria are not met.
  Respiratory or skin sensitisation: Based on available data, the classification criteria are not met.
  CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction)
  Germ cell mutagenicity: Based on available data, the classification criteria are not met.
  Carcinogenicity: Based on available data, the classification criteria are not met.
  Reproductive toxicity: Based on available data, the classification criteria are not met.
SECTION 12: Ecological information

12.1 Toxicity
- Aquatic toxicity: No further relevant information available.

12.2 Persistence and degradability No further relevant information available.

12.3 Bioaccumulative potential No further relevant information available.

12.4 Mobility in soil No further relevant information available.

Additional ecological information:
- General notes: Not known to be hazardous to water.
- 12.5 Results of PBT and vPvB assessment
  - PBT: Not applicable.
  - vPvB: Not applicable.
- 12.6 Other adverse effects No further relevant information available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods
- Recommendation
  Must not be disposed together with household garbage. Do not allow product to reach sewage system.

Uncleaned packaging:
- Recommendation: Disposal must be made according to official regulations.

SECTION 14: Transport information

14.1 UN-Number
- ADR, IMDG, IATA UN3218

14.2 UN proper shipping name
- ADR 3218 NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.
- IMDG, IATA NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.

14.3 Transport hazard class(es)
- ADR, IMDG, IATA
  - Class 5.1 Oxidising substances.
  - Label 5.1

14.4 Packing group
- ADR, IMDG, IATA III

14.5 Environmental hazards:
- Marine pollutant: No
<table>
<thead>
<tr>
<th><strong>14.6 Special precautions for user</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning: Oxidising substances.</td>
</tr>
<tr>
<td>EMS Number: F-A,S-Q</td>
</tr>
<tr>
<td>Stowage Category: B</td>
</tr>
<tr>
<td>Segregation Code: SG38 Stow &quot;separated from&quot; ammonium compounds. SG49 Stow &quot;separated from&quot; cyanides SG62 Stow &quot;separated from&quot; sulphur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>14.7 Transport in bulk according to Annex II of Marpol and the IBC Code</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Transport/Additional information:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ADR</td>
</tr>
<tr>
<td>Limited quantities (LQ): 5L Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml</td>
</tr>
<tr>
<td>Excepted quantities (EQ)</td>
</tr>
<tr>
<td>IMDG</td>
</tr>
<tr>
<td>Limited quantities (LQ): 5L Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml</td>
</tr>
<tr>
<td>Excepted quantities (EQ)</td>
</tr>
<tr>
<td>UN &quot;Model Regulation&quot;: UN 3218 NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S., 5.1, III</td>
</tr>
</tbody>
</table>

**SECTION 15: Regulatory information**

<table>
<thead>
<tr>
<th><strong>15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Directive 2012/18/EU</td>
</tr>
<tr>
<td>Named dangerous substances - ANNEX I None of the ingredients is listed.</td>
</tr>
<tr>
<td>Seveso category: P8 OXIDISING LIQUIDS AND SOLIDS</td>
</tr>
<tr>
<td>Qualifying quantity (tonnes) for the application of lower-tier requirements: 50 t</td>
</tr>
<tr>
<td>Qualifying quantity (tonnes) for the application of upper-tier requirements: 200 t</td>
</tr>
</tbody>
</table>

| **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out. |

**SECTION 16: Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

| **Department issuing SDS:** Technical Department. |
| **Contact:** Technical Director |
| **Abbreviations and acronyms:** |
| ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) |
| IMDG: International Maritime Code for Dangerous Goods |
| IATA: International Air Transport Association |
| GHS: Globally Harmonised System of Classification and Labelling of Chemicals |
| EINECS: European Inventory of Existing Commercial Chemical Substances |
| ELINCS: European List of Notified Chemical Substances |
| CAS: Chemical Abstracts Service (division of the American Chemical Society) |
| VOC: Volatile Organic Compounds (USA, EU) |
| PBT: Persistent, Bioaccumulative and Toxic |
| vPvB: very Persistent and very Bioaccumulative |
| Ox. Liq. 3: Oxidizing liquids – Category 3 |